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The role of VET in transitioning to renewable energy sources

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Keywords
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Abstract

The Federal Government's Renewable Energy Target (RET), while too conservative according to reliable sources, has established that by 2020, twenty percent of Australia's electricity supply will come from renewable sources, primarily wind and solar energy. In this paper, we consider the implications of the transition to renewables for the Australian labour market in three ways. First, we critically review the literature on how the shift to renewables will impact on jobs in terms of the number and types of new jobs and those that may be phased out. Second, by drawing on illustrative examples of training and education programs currently available, we propose models of good practice and areas requiring attention. Finally, we raise and tentatively explore issues arising from existing and changing models of interaction between government, business and other parties in relation to the VET sector's role in developing the labour market and skills required for a smooth transition to renewable energy.

Introduction

This paper is based on the premise that transitioning to renewable sources of energy is a positive and necessary response to mitigating the risks associated with climate change. The Australian Government has committed to sourcing 20% of our energy needs from renewables by 2020. By comparison, Germany has recently revised its renewable energy target (RET) to 35% by 2020 (Peacock 2013). While our RET may be modest it is worthwhile and we set out to explore the role of the VET sector in achieving the transition. We begin by critically reviewing the literature dealing with the impact of a transition on jobs and skill needs. We then draw on illustrative examples of training and education programs and resources to consider how the VET (part of the tertiary) sector has responded to the labour and skill needs arising from the transition. In relation to this, the paper illustrates that while the sector faces ongoing challenges in meeting these skill needs, commendable progress has also been made. It is however, in proposing a role for VET in managing the transition that we succeed in raising a number of issues and thereby clarifying the uncertainty rather than resolving the problem.

It is worth noting how several terms relating to renewable are defined in general use. The term 'renewable' is not synonymous with 'sustainable' energy, which is generally defined as the 'provision of energy such that it meets the needs of the present without compromising the ability of future generations to meet their own needs' (see also Brundtland 1987:43 in Brown & Cartledge 2011). The two components of sustainable energy are renewable energy and energy efficiency, and it would seem the latter encompasses the use of sources that have a 'minimal impact on the environment'. The term 'green' occurs widely, e.g., green energy, green jobs, and green skills, and is generally interchangeable with both low carbon and sustainable. Green power is defined as energy that is produced from renewable or non-polluting and non-hazardous such as wind turbines, geothermal power plants, and solar-cells (Business Dictionary.com). 'Sustainability' in VET is interpreted much more broadly than the transition to renewable energy.

The impact on jobs of transitioning to renewables

The nature of job creation as a result of the development of renewable energy is commonly classified in three ways: direct, indirect and induced employment (Phillips & Harsdorff, n.d.; International Labour Organization, n.d.). Direct jobs arise from activities involved in the construction, installation, operation and maintenance of renewable energy facilities, including an energy developer, a wind turbine installation and commissioning supervisor or service technician. Indirect employment derives from activities which support the above, such as transportation, or steel manufacturing, while induced employment refers to jobs created as a flow-on from both of these; that is, jobs in hospitality, the provision of accommodation and other services arising from consumer spending by those employed in a green-powered enterprise. In terms of measuring the numbers of jobs created from renewables, sources refer to gross employment effects, which is a measure of the total number of jobs either created or predicted to arise from renewable energy and also to a net employment effect, which measures the gross number of jobs created in renewables minus the loss of jobs in fossil fuel industries.

However, there are a number of issues contributing to the tentativeness of any figures for green jobs. Firstly, while direct employment is relatively uncomplicated, it is more difficult to define clearly and then count indirect and induced employment. Secondly, not all job losses in fossil fuel industries are attributable to renewables. Renewable energy is more labour intensive (IRENA 2011), particularly in the stages of development where jobs are needed in construction and installation. By comparison, labour requirements in oil, gas and coal industries are reducing, due to the maturity of the industries and the greater scope for technological efficiency, even given recent expansion on the scale of operations (Worldwatch Institute 2012).

Before discussing estimates of job creation from the transition to renewables, some details regarding the methodologies used may be helpful. Phillips and Harsdorff (n.d.) describe the most common and straightforward methodology used as being inventories and surveys; for example, a questionnaire sent to companies, government departments or analysts, which draws on regional databases to provide employment statistics. A second, perhaps more sophisticated method uses input-output analysis and social accounting matrices (Phillips and Harsdorff, n.d.: 3), which list the subsectors in an economy and detail how outputs from one sector are used as inputs in others, drawing on information from national accounts. Both of these methods are used to provide measures of current situations. In order for more predictive or forward looking estimates of job creation, a third method uses data from the former methods to construct 'computable general equilibrium and related complex models' to observe the impact on an economy of introducing reforms designed to promote the transition to renewable energy. In turning to actual estimates of jobs, both globally and locally, it would appear that they reflect not so much the capacity of renewable sources to provide for any nation's energy needs, but rather the will or commitment of the government of the day to promote investment in renewable energy (IRENA 2011: 20; Pew Charitable Trust 2010: 11). Given such contextual variations and the uncertainties in collecting and interpreting data, it is not surprising that estimates of job creation numbers vary.

Current estimates of global employment in renewables are, according to the Worldwatch Institute (2012), that 2.3 million people are engaged in both direct and indirect jobs. This figure is acknowledged as 'conservative' and contrasts with the 3.5 million jobs estimated for

2010 by the International Renewable Energy Agency (IRENA 2011: 4). Evidence suggests that while solar and wind industries are growing, biofuel industries are the largest employers. More than one million jobs are found in the biomass and biofuels sector though, it has to be said, there are ‘rising doubts’ about its environmental and economic impacts as well as concern for the sector’s low wages and poor working conditions (Worldwatch Institute 2012). The solar thermal industry employs at least 624,000 people and solar PV sector accounts for an estimated 170,000 jobs. The wind power industry employs some 300,000 people and finally, small-scale hydropower and geothermal energy are far smaller employers (Worldwatch Institute 2012). The countries where significant employment in renewables occurs are China, Germany, and the US. In China, around one million are employed in renewables, where solar PV, small hydropower and wind turbine manufacturing provide for global markets. In Germany, in 2006, 259,000 were employed in direct and indirect renewable jobs. In the US, it is estimated that in 2006, 200,000 direct jobs and 246,000 indirect jobs existed in the renewables sector (Worldwatch Institute, 2012).

Turning to Australia, in 2011, the renewable energy sector was estimated to be providing 9.6% of Australia’s total electricity (Clean Energy Council 2011: 4). This in itself suggests that considerable progress is needed if the 2020 RET is to be achieved. In 2009, a survey was conducted of the renewable energy sector by the Clean Energy Council, on behalf of the Federal Department of Environment, Water, Heritage and Arts, identifying 1505 renewable energy companies. Using a combination of survey methodology and social accounting matrices, described as ‘international multipliers’, a total of 10,370 jobs were estimated to be in the sector and a database was produced (Clean Energy Council 2009: 7). The report, ‘Renewable Energy Jobs in 2009 and forecasts to 2020’, states that solar photovoltaic (PV) systems and a combination of solar, wind and micro hydro systems were the largest sources of jobs, followed by wind energy systems. It was predicted that by 2020, 24,000 to 30,000 jobs in renewables would be required (Clean Energy Council, 2009: 5). A later report estimated there were ‘around 8000 full time equivalent jobs’ in direct employment (Clean Energy Council 2011: 12). In addition it was estimated that around 6000 jobs existed indirectly; for instance, in the solar hot water industry. Expansion in the renewable sector was attributed partially to ten new projects, seven of which were wind-farms spread across the southern states and including Tasmania. Vorath (2012) reports that in the first quarter of 2012, South Australia sourced more than one third of its electricity from non-hydro renewables and that over the year, according to the Australian Energy Market Operator, wind energy accounted for more than 22 percent of capacity and 20 percent of the state’s electricity supply.

While progress in the renewable sector has been slow, it has nonetheless been steady. In 2012, around eight million solar PV panels were installed on household rooftops in Australia. In Western Australia, the Greenough River solar farm, using 50,000 PV panels was opened, with 50 MW capacity, reported to be Australia’s largest solar power plant to date (Vorath 2012). Large scale solar projects have had less success in NSW. In Moree, for example, a solar farm was awarded funds under the Federal government’s Solar Flagship program, which were subsequently withdrawn (Parkinson 2012) and is still facing an uncertain future. One reason for the slow growth, particularly in establishing large scale solar power plants is the high financial outlay initially required for infrastructure. This may account for why much of the recent literature has focused on the potential capacity of renewables for job creation rather than the rate of development in reality.

For example, Lovegrove et al (2012: 4) point out that Australia has the 'world's leading solar resource', with the capacity to provide a power supply which 'vastly exceeds all predictable energy demands'. While the current national electricity generation capacity from all sources is 50 gigawatts (GW), Lovegrove, et al (2012: 4) argue that it is technically feasible to add up to 15 GW of Concentrated Solar Power (CSP)[1] capacity. They predict that every 100 megawatt (MW)[2] system would create around 500 job years during construction and 20 jobs during operation, mostly in regional areas. Continuing operation and maintenance jobs range from .2 jobs to .7 jobs per MW, with smaller plants having much higher employment. Indirect and induced jobs are likely to be created in regional areas as a result of such renewable projects (Lovegrove et al. 2012: 27).

In South Australia, a coalition of community and interest groups has developed a proposal for replacing two brown coal powered stations in Port Augusta with six solar thermal power towers. Aulby (n.d.) argues they 'would provide around 1300 construction jobs, 225 manufacturing jobs and a further 360 ongoing, permanent jobs'. Similarly Evans (n.d.), drawing on research from the University of Newcastle's Centre of Full Employment and Equity, proposes that if six coal-fired power stations in the Hunter Valley were phased out and local energy needs met by renewable energy, 10,000 to 15,000 new jobs could be created (Bill, Ricardo et al. 2008 in Evans n.d). Both proposals acknowledge that job losses will occur in transitioning to renewables; however, Aulby (n.d.) makes the point that similar skill sets are required regardless of the source of power:

> Solar thermal power is largely identical to coal fired power generation in terms of turbine, generator and other thermal infrastructure. For this reason, many of the current coal power station jobs are directly transferable.

In relation to wind energy, Clarke (2012) describes the employment potential of wind energy as arising primarily during the construction phase of wind turbines. He also points to the generation of indirect and induced jobs, during this phase, such as business for local contractors providing electrical, transport and concreting services as well as induced employment for hotels, motels, cafes and other service providers. This brings us to consider the types of jobs, skills and training required for renewables.

The types of jobs, skills and training requirements to emerge from a transition to renewables are of relevance to both VET and higher education (HE) levels of Australia's tertiary sector. While IRENA suggests that a skill mapping exercise is needed in order to identify and respond to emerging skill needs, there are sound analyses available of the direction many countries are headed. For example, a comprehensive report from the International Labour Organization (Strietska-Ilina et al. 2011) sets out three ways in which transitioning to renewable impacts on skill needs. First, there are shifts in activities due to structural shifts between and within industries as the use of renewables expands and fossil fuels decline. This shift tends to be towards increasingly professional level skills, including lawyers, accountants, technical and scientific personnel (IRENA 2011: 7). Industry surveys in Germany have found renewable energy jobs are relatively highly skilled. Lehr et al (2011 in IRENA 2011) reported 82% of those employed have vocational qualifications and 40% have

[1] Concentrated solar power (also called concentrating solar power, concentrated solar thermal, and CSP) systems use mirrors or lenses to concentrate a large area of sunlight, or solar thermal energy, onto a small thearea. Electrical power is produced when the concentrated light is converted to heat, which drives a heat engine (usually a steam turbine) connected to an electrical power generator (wikipedia).

[2] 1000MW = 1GW

university degrees, compared to the whole industrial sector, which has 70% and 10% respectively.

Second, entirely new jobs will emerge with the introduction of new regulations and the development of new technologies (Strietska-Ilina et al. 2011: xvii). Examples of these have been neatly summarized by the US Environmental Protection Agency (2012), including energy auditors, insulation and weatherization technicians, HVAC technicians and installers, wind energy technicians, solar PV or heater installers, manufacturers, distributers and salespeople of energy efficient products, low carbon (or clean energy) transportation planners, manufacturers, refiners or technicians, research and development staff, and state energy and/or environment office staff.

Hence, new training and education programs are needed for these jobs. Finally, new knowledge and skills will be needed by workers in existing jobs as these workers will increasingly face imperatives to become green (Strietska-Ilina et al. 2011). As a consequence, changes to skill requirements will be pervasive, creating a need for all existing curricula, qualifications and standards of training programs at all levels to be more sustainable. Strietska-Ilina et al. (2011: xxi) conclude that this will have implications for core skills of employability, including competencies in literacy, numeracy, decision-making, teamwork and communication. Specifically, in Australia, there is a need for higher levels of scientific literacy, so that more people understand the science of climate change and how this is impacting on jobs, industries and lifestyles.

Training and education programs for renewable energy industries

Turning to the VET sector's response to skills needs in renewable energy industries, this paper does not attempt to extensively review relevant VET programs. We acknowledge the comprehensive and valuable research of others in this area, such as Brown and Cartledge's (2011) analysis of VET policy developments in addressing climate change, already reported on in this forum and still underway. Our intention is to consider a small number of recent developments in VET programs that reflect both the problems with maintaining a broad focus on sustainability and examples of what we consider as hopeful, i.e., real progress towards transitioning to renewables. For the purpose of illustrating the types of courses and training currently available, this paper focuses on Sydney Institutes of TAFE NSW, considering only a few syllabi and programs.

We have seen above that in terms of skill needs, there are reasonable grounds for subsuming renewables within the broader policy goal of training for sustainability. The skills required to work efficiently in energy industries based on fossil fuels and related industries are largely transferable to jobs in renewables. However, while the concept of sustainability includes adopting practices to preserve the environment and its resources for future generations, it is primarily about resource efficiency. In other words, maintaining the status quo, but doing it with a more efficient use of resources. There is evidence to suggest that the VET sector has addressed much more comprehensively the latter at the expense of the former. This is understandable, given that historically, VET policy has generally defined itself in terms of being 'industry led' (ANTA 2004). Since its foundation, 'the Training Reform Agenda and National Training Framework exemplify how policy goals in Australia's VET system have been oriented to serving the interests of industry. Accepted practice has been for industry to define policy goals to meet their own needs and to advise on their implementation' (Cornford 2000: 137, in Fitzgerald 2006: 127). In keeping with this orientation, most training and education programs for sustainability available in 2013 continue to embody earlier conservative, in the political as well as ecological sense, policy statements. For example, the Commonwealth's National Action Plan *Environmental Education for a Sustainable Future,* in 2000, recommended that environmental education activities, amongst other criteria, '… encourage the pursuit of environmental goals in a way that acknowledges other powerful and legitimate social and economic goals' (Department of Environment and Heritage, 2000: 6).

The plan provides information and guidance to curriculum developers and policy makers on how education for sustainability may be effectively incorporated into curricula to help students learn to both design and implement actions that can eventually contribute to a more sustainable future and it provides guidance regarding the most appropriate times and environments in which this learning should occur. However, the document does not intend to specify how education for sustainability will be taught, while at a post-secondary level, professional and vocational skills are also required across all industry sectors in order to equip all Australians with the knowledge and skills to live sustainably as a response to climate change imperatives. Hence, professional development of teachers needs to occur almost simultaneously with the development of appropriate training for new jobs and skills in renewables. In response, most VET providers, with varying degrees of success, have consequently at least stated their commitment to ongoing professional development of their staff in green skills and the integration of environmental sustainability across all curriculum areas.

The Industry Skills Council, Manufacturing Skills Australia (MSA) has produced the Sustainability training package targeting two sectors, the environmental and sustainability, for the purpose of providing 'skills to enable enterprises to audit their own sustainability performance, to develop a strategic plan and response to non-conformances; and to develop strategies for increasing sustainability performance' (MSA, 2012: 60). It is designed to 'provide the skills needed to respond to current and new sustainability compliance regimes and environmental standards especially those associated with carbon and carbon equivalent use and management (MSA 2012: 60). The types of jobs occurring in the environmental sector are indentified as technicians and paraprofessionals in areas such as environmental monitoring of air, clean water, contaminated land and groundwater, soil and noise, environmental information management systems, energy technologies and services, environmental site management and pollution control. The sustainability sector is identified as broader than jobs in 'manufacturing operations', and covers 'operations of suppliers and customers along the manufacturing value chain'(MSA 2012: 59).

It responds to a predicted rise in 'the overall demand for competitive systems and practices qualifications … as enterprises continue to come under competitive pressures and the consequent need for efficiency improvement becomes stronger across the economy' (MSA 2012: 62). Furthermore, this training package addresses the needs for higher levels of knowledge and skills in understanding and responding to climate change. For example, the unit of competence, Develop a business case for sustainability improvements (MSS015007A) could present a much needed holistic approach to performing any job and provide 'business, ecological, social and sustainability benefits' (MSA2012: 314). At first glance, this training package has the potential to address the skill needs not only of renewables industries but all industries. Ongoing research is called for in the progress and practice of its roll out.

There is evidence to suggest that training in sustainability can be tokenistic. Empirical evidence lies in the disjuncture in programs and units of competence between stated and feasible outcomes, given the nominal hours of training and other factors. For example, the Certificate IV in Skills for Career Pathways (10698; National Course Code 10092NAT) is designed for and offered to people who require a high level of Employability Skills and knowledge to enhance their career opportunities, access further vocational training or become engaged with the community. Among other outcomes, to achieve successful completion of this course the learner should be able to 'apply safe and sustainable practices in a variety of contexts including a workplace, community or educational setting'; however, the one compulsory unit NSWTSUS403B, 'Apply sustainability practices', recommends only 5 nominal hours (out of a total of 280). Similarly, the Certificate II in Skills for Work and Training (10697; 10089NAT) is designed for and offered to people who require more basic Employability Skills and knowledge to access work, vocational training or community engagement. Unlike its higher-level counterpart, neither a sustainable outcome nor compulsory unit is specified, but three elective modules (NSWTSUS202B, 'Investigate the principles of ecosystems and sustainability', NSWTSUS203B, 'Investigate community action to contribute to sustainability' and CPCCCM1012A, 'Work effectively and sustainably in the construction industry') suggest nominal hours of 25, 20 and 12 respectively (out of a total of 320).

A quick survey of less generic courses, spanning several industries reveals no compulsory units containing the word 'sustainability' nor synonyms for it. From health and education (10698) to many more industries, ranging across aged care to horticulture and automotive, design, retail and plumbing, to name just a few (in 10697), specific industry courses such as Certificates III and IV in Plumbing (10233 and 10247; National Course Codes CPC32411 and CP40911 respectively) as well as the Certificate III in Fire Protection 10237 (National Course Code CPC32811) programs could apply to vital and future training and employment in renewables, the syllabi simply stress that 'training and assessment for the recognition of skills must be undertaken in a real or very closely simulated workplace environment'. Further, only course 10247 has an elective unit (CPCCBC4019A 'Apply sustainable building design principles to water management systems') with a recommended nominal duration of 40 hours out of a possible total that can exceed 600. It is feasible that on average, these training programs devote around 5% of training time to specific green units for a sustainable future. We question whether this is sufficient. Furthermore, it is not simply to the guidelines provided in curricula on which we need to focus attention, but the individual ways that various institutes, colleges, sections and teachers interpret and apply these to their delivery and assessment.

In 2009, the Federal Government's Education Investment Fund (EIF) approved funding of $6.4 million to establish the first of its kind: a Sustainable Hydraulic Trade Centre for sustainability in training and up-skilling within the plumbing and fire trades at Randwick College of TAFE NSW, Sydney Institute. The centre not only includes installation of green technology that is accessible and interactive, but provides the necessary infrastructure that will enhance underpinning knowledge and increase the ability to transfer information for student learning. Opening in 2011, the Centre uses an environment management system (EMS) aligned to a web-based energy management presence so that real time data for measurement of utilities consumption can proceed. This data is included in state-of-the-art training delivery and is also available for learning and research purposes across industry and education sectors, thereby improving learning experience and employment opportunities for new and existing trades people. Further, this innovative centre houses six new hydraulic trade workshops, four specialist hydraulic labs for plumbing, sprinkler fitting and fire services trades. So, despite the overall tokenism of curricula, this Centre has enabled the delivery of training in essential hydraulic trades using best practice green building skills, focusing on waste water treatment and reuse, evacuated tube water heating and rain water harvesting. Furthermore, the centre has forged partnerships with industries ranging from the Centennial Park Trust, Randwick Council and the University of NSW, to Tyco Industries and Aqua Clarus wastewater (Sydney Institute 2012). In 2012, TAFE NSW Sydney Institute recorded that it has a reduced carbon footprint of over 10% while its reductions in water use through partnerships, better practice and recent uptake of green technologies have meant its water use has also been significantly reduced by over a third since 2000 (Sydney Institute 2012) . Projects such as the Sustainable Hydraulic Trade Centre are examples of best practice training and the difference that VET can make in a climate-change economy.

The role of VET in transitioning to renewables

In seeking to advise on the role of VET in transitioning to renewables, the most salient point to be observed is the rapid pace of change. We deal with this by briefly reviewing how informed discussion of VET's role has developed and changed, in line with developments in government policy, technology and in industry. Our premise is that transitioning to renewables is not only worthwhile but imperative in mitigating the impact of climate change. Taking steps towards transition involves multiple stakeholders: it requires global as well as national, state, sector, industry and individual policy and practice. We iterate our view of the positive steps towards sustainability taken by the VET sector and make cautious recommendations for the future.

As the Stern Review (2007: i) explicitly stated, climate change is 'the greatest and widest-ranging market failure ever seen'. By implication, leaving it to the market to deal with the problem is dangerous; we need a response involving all of the above stakeholders. The report argues 'the benefits of strong, early action considerably outweigh the costs' because, among other reasons, 'ignoring climate change will eventually damage economic growth' (Stern 2007: ii). One solution lies in stabilizing 'greenhouse gas concentrations in the atmosphere' and measures set out for doing this include reducing demand for emissions intensive goods and services, increased efficiency, action on non-energy emissions; for example, by preserving forests and switching to lower-carbon technologies (Stern 2007: xi). These measures implicate government policy in setting a carbon price, imposing regulations and influencing behavioral change, through various means including education and training. Industry and enterprises are required to foster research and development, to promote innovation, and provide the necessary technology and manufacturing to produce cost effective energy efficient products and services (Stern 2007). However, the report does not have a lot to say on to the role of education and training and offers little in relation to the VET (tertiary) sector in the context of Australia.

Karmel (2009: 8) questions the role of VET policy in pushing a green agenda. He argues that from an economic perspective, training in sustainability may not be effective or an efficient use of education and training resources. This is because 'the way business operates is driven by changing costs, new technologies and new regulations' and by implication, not specific priority areas selected by the VET sector. On the face of it, this is a rational observation: renewable industries are unlikely to develop, simply because of the availability of sustainability training and qualifications. However, this position raises the question, if providing sustainability training is not going to hasten industry's transition to renewables, then what would be a more appropriate role for VET towards this goal? Brown and Cartledge (2011), drawing on the Australian Government's National action plan for education for sustainability (DEWHA 2009 in Brown & Cartledge 2011: 10), offer a much stronger view on the role, in terms of 'supporting and upskilling the labour force to work with new technologies, materials and systems: alongside providing for the transition period into sustainable practices from the resource hungry practices of the past'. However, they also point out, 'Should the momentum of the *greening* of industry practice continue in line with social, political and economic demand, then this would place VET as reactive rather than pro-active in meeting labour market needs'. They conclude that the transition to a low carbon economy is necessarily underpinned by an 'environmentally aware and sustainability-focused labour-force'. Therefore, an 'implicit link' exists between 'VET practice and a sustainable low-carbon economy' (Brown & Cartledge 2011: 11). In order to make this explicit, the implicit is the challenge.

No doubt the link between the VET sector and transitioning to renewables is shaped by government policy and, in this respect, challenges of a different nature exist. While Brown and Cartledge (2011: 10) state that 'political rhetoric abounds on the necessary transition to a low-carbon economy as quickly as possible', recent policies at both national and state (NSW) level contradict this. The Energy White Paper (Department of Resources, Energy and Tourism 2012) sets out a vision of Australia pumping out ever increasing levels of greenhouse gas emissions for the supposed prosperity and betterment of our nation, our neighbours and the global economy.

> We are the world's largest coal exporter and third-largest uranium producer, and in future years will be the world's second-largest liquefied natural gas (LNG) exporter. Our energy exports will continue to support higher living standards for billions of people in our region… Australian coal production is expected to continue its strong growth by an annual average of 8%, from a value of $14 billion in 2010–11 to an estimated $20 billion by 2016–17 (Department of Resources, Energy and Tourism 2012: x).

Furthermore, a commitment to gas is set out as the most feasible transitional fuel. McGrath (2012) critiques this as talking 'about responding to climate change while planning the opposite… [it] plans to diversify energy production and includes initiatives for renewable energy but this is additional to burning all of our coal and gas reserves'.

Both Labor and Liberal NSW Governments have demonstrated steady support to the coal industry, based on statistical measures of output. According to the current Government's own research, production has expanded dramatically over that past decade, from over 145 million tonnes in 2002 to just under 205 million tonnes in 2010-2011 (Wales 2012: 11). In spite of the environmental costs, the contribution (in 2011) of the state's 61 coal mines (Wales 2012: 15) to the economy is significant. '[It] is the most important mining commodity in NSW accounting for 49.5% of the contribution made by primary industry to the NSW economy in 2009 – 2010' (Wales 2012). It is not only governments who appear to cling to fossil fuel energy sources: mining entrepreneurs, companies, industries and associated interests are committed to resisting the transition. Potter (2013) aptly reports, 'history shows those who control the oil and gas taps wield great influence on the world stage'. Rather than a proactive role in facilitating a transition to renewables, our governments' stance seems retrograde. In 2012, the NSW Planning Assessment Commission approved a coal project from Whitehaven at Maules Creek for 'one of the biggest open cut mines in the world' (ABC 2012). There are reasonable grounds for concluding that government policy at both levels is failing to keep pace with the imperative to transition. However, contrary to Brown and Cartledge's (2011) argument that relative to government policy, 'Australia is slow to develop sustainability as an industry in its own right', recent evidence points to a dramatic turnaround. Wind and solar energy are emerging as not only economically viable, but cheaper than fossil fuels.

By early 2013, sufficient 'data, cost profiles and market analysis' have emerged to prompt Liebreich, from Bloomberg New Energy Finance, to announce, 'the perception that fossil fuels are cheap and renewables are expensive is now out of date' (Priest 2013). Parkinson (2013) reports 'the idea of a rapid change to a largely renewable energy grid no longer seems aspirational, it could be inevitable'. According to Parkinson (2013), this new evidence reveals that 'wind energy (and in some cases solar PV) is already cheaper than coal and gas in Australia' and is predicted to continue falling in price. Perhaps we are witnessing a period in time when market mechanisms will in fact produce the transition to renewables and hence industry will once again provide the lead to the VET sector.

Conclusion

We have illustrated that the transition to renewables is having an impact on jobs at many levels: in creating new jobs, in transforming existing jobs and in reinforcing demands on skills such as employability, literacy and numeracy. The VET (tertiary) sector's response to the transition is subsumed within the wider initiative of training for sustainability. We have noted both problems and commendable achievements, including policy documents such as the Sustainability Training Package and instances of good practice in programs, such as the sustainable Hydraulic Trade Centre at Randwick College of Sydney Institute, TAFE. Similarly, VET educational policy and training initiatives, combined with the rapidly changing nature of evidence emerging regarding the economic viability of renewables, suggest that both industry and training may be one step ahead of current government policy, which seems still to be clinging to controlling and exhausting remaining coal, oil and gas reserves. Given that a clear commitment to transitioning to renewables does not have bipartisan support at a national level, then training and educating Australians about this environmental imperative needs to be a role for VET.

In conclusion, since policy making is traditionally a relatively chaotic and drawn out procedure (Kingdon 2003), the practice of developing the labour market with the requisite skills for a transition to renewable energy can and probably will happen without necessarily being a smooth and continuous process. Our position in this paper has been that renewables are the most sustainable solution to the current climate change induced crisis and that that the path to the solution is being shaped by numerous sometimes competing parties, among which the VET sector may not be particularly influential. Therefore, it may be the role of VET to continue to do what they have always done best; that is, to combine theory with practice, thereby demonstrating the effectiveness of their approach to embedding sustainability in curricula. But this needs to be sustainability underpinned by explicit attention to scientific literacy, demonstrated in models of good practice and that values and supports the transition to renewables.

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